The Prophylactic Effect of Synovectomy of the Knee in Rheumatoid Arthritis

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One hundred and twenty-seven synovectomies were performed for rheumatoid arthritis of the knee at the Hôtel-Dieu Hospital, Montreal, over the past 15 years. The authors have reviewed 56 synovectomies in 49 patients to determine whether the operation might have any prophylactic value.

They conclude that synovectomy of the knee can delay or prevent gross joint destruction if the operation is performed during the synovial phase of the disease. If it is performed too late, the operation can at best only salvage an already damaged knee.

The surgical technique, the operative indications and the postoperative regimen are described.

Sur un total de 127 synovectomies du genou faites à l'Hôtel-Dieu de Montréal, entre 1950 et 1965, les auteurs ont fait une étude des résultats de 56 synovectomies chez 49 patients souffrant d'arthrite rhumatoïde et ayant subi cette intervention à des stages variés.

Cette étude permet aux auteurs de conclure que dans la majorité des cas, malgré un pourcentage d'environ 5% de récidive, la synovectomie a pour effet de retarder ou de freiner la destruction de l'articulation causée par la maladie.

Quoique cette opération soit souvent pratiquée trop tard pour en tirer tout le bénéfice, elle n'a jamais été faite trop tôt; elle s'adresse d'abord et surtout au stage synovial de l'arthrite rhumatoïde.

On décrit la technique chirurgicale, les indications pour cette opération et le cours post-opératoire.

IT IS generally accepted that rheumatoid joint involvement begins as a synovial lesion.[12] As the disease develops, the previously normal synovial membrane becomes transformed into an aggressive, destructive and, at times, obstructive tissue;[11] indeed, the rheumatoid synovial pannus invades and erodes articular cartilage and occasionally proliferates and hypertrophies to such an extent that it mechanically limits joint mobility. Frequently associated with persistent or recurrent effusions, the rheumatoid inflammatory process stretches ligaments and capsule, destroys menisci, lyses cartilage, and erodes subarticular bone. Once such damage has taken place in a weight-bearing joint, the added stress of wear and tear is superimposed thereon and further destruction is inevitable. Osteoporosis, muscular atrophy and joint subluxation eventually complete a vicious circle and the joint damage becomes irreversible.[6-8] By that time a golden opportunity to institute an effective form of treatment has been missed.[4] Theoretically at least, it would appear that the optimal time to operate on a rheumatoid joint is during the synovial phase of the inflammatory process, and that the ideal aim of surgery should be prevention of damage, deformity and impairment of function, rather than salvage.

While the *therapeutic* efficacy of synovectomy is now generally accepted,[1, 2, 9, 10] the *prophylactic* value of this operation in the treatment of rheumatoid arthritis of the knee has not yet been fully assessed. The precise indications for and the exact timing of this form of surgical intervention are still contentious. The characteristically unpredictable nature of the disease, the varying pathology at the time of surgery, and the lack of absolute, scientific controls are partly responsible for our incomplete knowledge in this respect.

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Despite these admitted obstacles and the limitations they impose, the investigation described in this communication was undertaken to assess the possible prophylactic value of synovectomy for patients with rheumatoid arthritis involving the knee joint. The term "prophylactic effect", as used in this communication, refers to the capacity of this operation to prevent or limit the development of such late sequelae of rheumatoid arthritis as joint subluxation, cartilaginous erosions and ligamentous destruction.

CLINICAL MATERIAL AND METHOD OF INVESTIGATION

This report is based on experience acquired in connection with 127 synovectomies* performed on patients with rheumatoid arthritis of the knee at the Hôtel-Dieu Hospital, Montreal, between 1950 and 1965 (Table I).

TABLE I.—KNEE SYNOVECTOMIES FOR RHEUMATOID ARTHRITIS, HÔTEL-DIEU HOSPITAL, 1950-1965

	Number of patients
Adequate follow-up and personal interview	56
Follow-up less than two years	51
Lost to follow-up	13
Dead	7
Total	127

Fifty-six unselected synovectomies (49 patients, seven bilateral synovectomies) were fully investigated; this group included 16 men and 33 women and their average age at the time of surgery was 46 years (range: 25 to 71 years). The average follow-up period was six and one-half years (range:

*The majority of the earlier operations were performed by the senior author.

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two to 12 years). These relatively long periods of follow-up allowed the authors to observe the subsequent evolution of the local rheumatoid disease with and without synovectomy.

The preoperative stage of the rheumatoid arthritis was assessed according to the standards established by the American Rheumatism Association (Table II). By comparing the preoperative and postoperative status of the knee operated upon in each case, it was possible to assess the value of the synovectomy. The results as evaluated by objective criteria and by the patient's subjective assessment were essentially comparable, pain relief being the patient's main concern, while the physical findings, the functional capacity of the knee, and the patient's work record were the objective criteria employed.

TABLE II.—CLASSIFICATION OF PATIENTS AT THE TIME OF SURGERY

Severity of rheumatoid progression	*Number of patients*
Stage I	8
Stage II	22
Stage III	19
Stage IV	7
Total	56

SURGICAL TECHNIQUE

Essentially the same surgical technique and postoperative routine were used throughout. Using a single, anterior incision, subtotal synovectomy was performed; posterior dissection using a second incision was occasionally necessary when tender synovial tissue was clinically palpable in the popliteal space. The menisci were removed when they were found to be torn or fragmented. The patella was usually shaved and spared. Thirteen patellectomies were performed at the time of synovectomy because of extensive cartilage lesions. Except for a slight extensor lag, there was no untoward effect following patellectomy.

The knee was routinely manipulated under general anesthesia on the seventh postoperative day, the joint being infiltrated with procaine and cortisone and then gently flexed to 90°. The patient was then referred to the physiotherapy department, and crutches were recommended for an average period of two months.

RESULTS

Forty-four (79%) of the patients were rated as improved (Table III). When the postoperative results were compared on the basis of the severity of the rheumatoid process (Table IV), it was noted seven of the 17 patients with bad results were among those with Stage IV lesions. Table IV suggests that the operation is much more successful when it is performed at an early stage of the disease, whereas if joint damage is already extensive (Stages III and IV) the chances of success are reduced almost to nil. The primary object of the operation is to prevent the development of an irreversible synovial lesion. It can provide very little benefit when the disease has progressed beyond the synovial tissue.

TABLE III.—RESULTS (56 SYNOVECTOMIES)

	Excellent	*Good*	*Unsatisfactory*	*Poor*
Number of patients	34	10	7	5
Percentage	60%	19%	12%	9%
	79%		21%	

TABLE IV.—RELATIONSHIP BETWEEN END RESULT OF SYNOVECTOMY AND SEVERITY OF DISEASE PROCESS

Severity of rheumatoid process		*End Result*				*Percentage of excellent and good results*
		Excellent	*Good*	*Unsatisfactory*	*Poor*	
Stage I	(6)	6				100
Stage II	(24)	19	5			100
Stage III	(19)	8	6	2	3	75
Stage IV	(7)			5	2	0
Total	56	33	11	7	5	
Total	56	*Excellent and Good* 44		*Unsatisfactory and Poor* 12		

Maximum improvement following synovectomy was usually achieved within six months, although some patients continued to improve for two years. Generally speaking, it is possible to predict the eventual end result of synovectomy within a few months following the operation. Patients with successful synovectomies usually had a smooth postoperative course and, within a month, joint pain was moderate and stiffness was minimal. On the other hand, unsuccessful synovectomies were usually recognized as failures immediately and their eventual unfortunate outcome soon became obvious.

Regeneration of thickened, grossly palpable and tender synovial tissue occurred in 6% of patients.[3] These local recurrences[14] were usually associated with gross systemic progression of the disease process, but they were occasionally attributed to incomplete synovectomy. Such local recurrences are not a contraindication to further surgery, and many of these patients responded well to a second synovectomy. The regenerated synovial tissue was usually more fibrous, almost avascular, and appeared to be less inflammatory and definitely less aggressive.

APPRAISAL OF PROPHYLACTIC EFFECT

In order to assess the prophylactic value of this operation, a special analysis of the end-results was carried out. The evolution of the local and the systemic manifestations of rheumatoid disease were compared, before and after surgery, in 18 patients whose records permitted this type of comparison (Table V). A lasting, systemic remission had occurred in only one of these 18 patients, and, as might be expected, this synovectomy yielded a

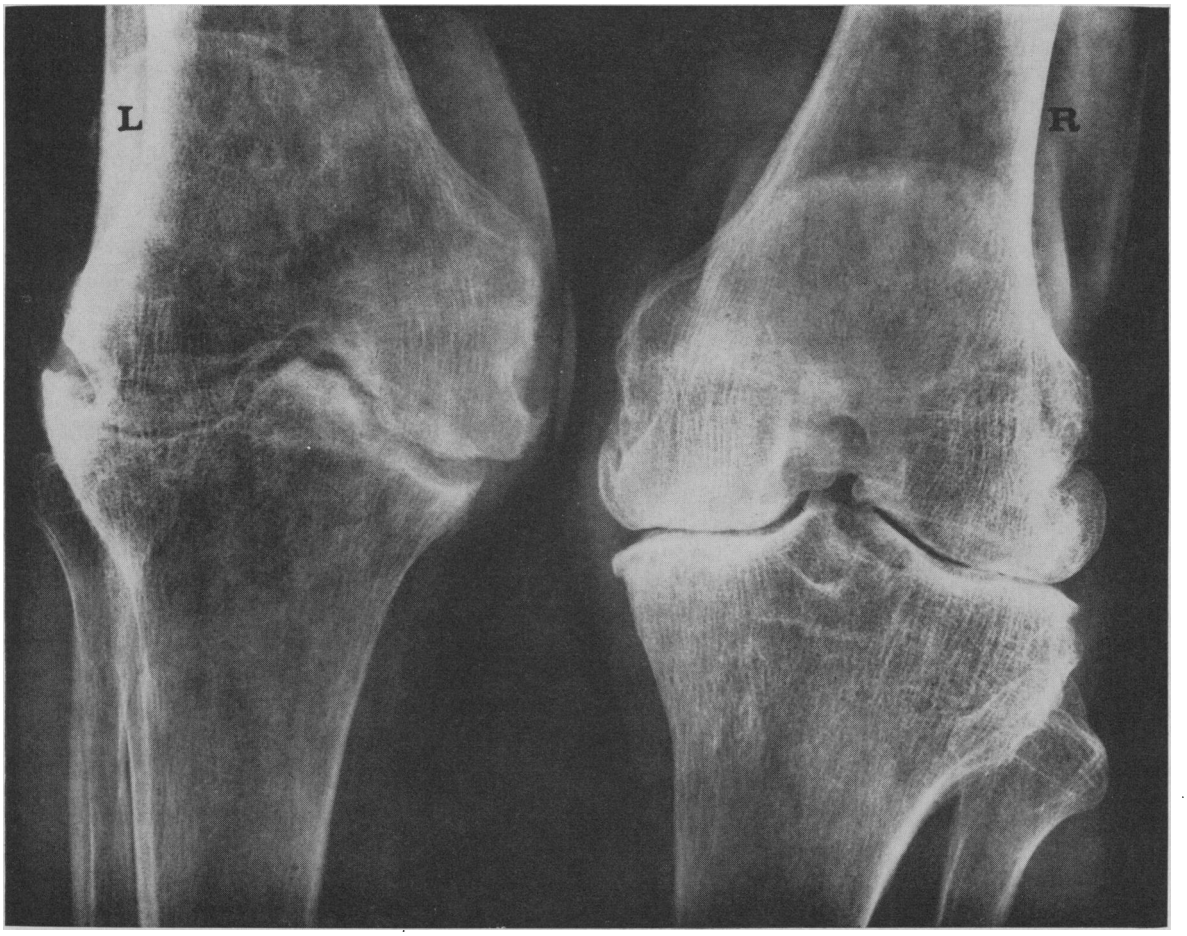

Fig. 1.—Radiographs taken 10 years after unilateral knee synovectomy for rheumatoid arthritis.

permanent good result. However, there was obvious systemic deterioration in the remaining 17 patients; in 14 of these the local postoperative improvement persisted in the knee operated upon despite the fact that the disease process progressed in other joints. This observation suggests that in these 14 patients the synovectomy favourably influenced the course of the local disease and protected that knee against further damage.

TABLE V.—PROPHYLACTIC VALUE OF SYNOVECTOMY, LOCAL RESULT OF SYNOVECTOMY COMPARED TO THE COURSE OF THE DISEASE

Progress of the disease	*Number of patients*	*Persisting local improvements*	*Loss of local improvements*
No apparent systemic deterioration	1	1	0
Definite systemic deterioration following operation	17	14	3

Macnab[5] conducted a similar investigation of 12 knee synovectomies in rheumatoid patients whose joint disease was predominantly monoarticular although there were obvious systemic manifestations as well (Table VI). Following operation the joint involvement remained predominantly monoarticular in four patients, but subsequently became obviously polyarticular in the remaining eight. Of these eight patients in whom the disease process had obviously progressed systemically, only one exhibited clinical evidence of local recurrence in the joint subjected to synovectomy. It would appear that, in seven of these eight patients, the synovectomy had protected the knee joint despite the fact that systemic progression of the disease had occurred.

TABLE VI.—PROPHYLACTIC VALUE OF THE SYNOVECTOMY[5]

	Preop.	*Postop.*	*Postop.*
	Articular distribution	*Articular distribution*	*Permanent local improvement*
Monoarticular disease	12	4	4
Polyarticular disease	0	8	7

An ideal method of verifying the prophylactic value of knee synovectomy would be to conduct a prospective study in which a unilateral knee synovectomy was performed on a selected group of rheumatoid patients with comparable involvement of both knees. The subsequent course of the disease could then be observed by comparing the knee operated upon with the unoperated control

knee. A research project of this nature could scarcely be justified, but, by coincidence, three of our patients with bilateral knee-joint disease provided such an experimental model. In each of these cases a synovectomy was performed on the more seriously affected knee; the patients were then instructed to return at a later date for surgery on the opposite knee, the latter being swollen but less painful. For various reasons these patients did not return for their second operation. When recalled at a later date for purposes of this review, the knee that had not been operated upon, and was originally less severely involved, had since deteriorated to a marked degree, while the knee that had been subjected to synovectomy had become asymptomatic and was clinically and radiologically the better knee (Fig. 1). It appeared that the operation had protected the knee from the destructive effects of the rheumatoid process. From a scientific point of view it is regrettable, but clinically fortunate, that there were only three such patients in this series. Although these three patients could scarcely qualify as a well-controlled series, the authors feel that, for these patients at least, the knee synovectomy appeared to have a prophylactic effect.

DISCUSSION

In view of the foregoing observations it is our opinion that, in properly selected patients synovectomy of the knee can be justified on the basis of its probable prophylactic value alone, irrespective of the therapeutic benefits that might be achieved. The authors believe that a moderately involved rheumatoid knee that does not respond to a proper medical regimen should be subjected to this operation. Therein, of course, lies the crux of the problem: exactly when should the operation be performed to obtain maximal improvement?

The first treatment of rheumatoid arthritis of the knee should obviously be a sound medical regimen; but the rheumatologist should not hesitate to consider surgery when he can palpate a thickened rheumatoid synovial membrane. If, in spite of adequate treatment, effusion and pain recur repeatedly, the involved synovial membrane should be excised before it produces irreversible joint damage. The operation should be performed before joint destruction is obvious on the radiograph if any prophylactic benefit is to be derived; however, definite therapeutic benefit may occasionally follow a synovectomy in spite of obvious radiologic signs of joint involvement. This operation is rarely performed too early, but if it is performed too late in the course of the disease, the end result is likely to be disappointing because the disease has then progressed beyond the synovial membrane and caused irreversible joint destruction.

Few surgical procedures afford more gratifying results than does a synovectomy of a rheumatoid knee when it is performed at the right time, on the right patient, in the right manner. The right time is during the synovial phase of rheumatoid involvement; the right patient is one whose synovial membrane is thickened, palpable and symptomatic in spite of a sound medical regimen; and the right manner involves a careful postoperative regimen with the judicious use of joint manipulation and intra-articular injection of a suitable corticosteroid.

It would be regrettable if a synovectomy, performed for prophylactic reasons, precipitated a systemic rheumatoid exacerbation or decreased the range of knee movements. In our experience with 127 synovectomies, we have encountered no systemic exacerbations that could be attributed to the operation.

In our series, when the preoperative and postoperative ranges of knee movement were compared, only 15% of the patients showed a loss of mobility (the maximal loss being 15°) following synovectomy. Most of those subjected to this operation (75%) quickly regained their preoperative range of movement, and indeed 20% showed improvement in mobility after their joint pain had subsided.

As well, advanced age and elevation of the sedimentation rate are not, as they were once considered,[7] contraindications to this operation. Synovectomy should obviously not be performed during a clinically florid phase of the disease,[13] but our experience has shown that good results can be frequently obtained in spite of a chronically elevated sedimentation rate.

SUMMARY

The results of 56 synovectomies (49 patients, seven bilateral operations) of the knee, performed on patients suffering from rheumatoid arthritis between 1950 and 1965, were studied in detail.

The theoretical advantages of this operation as a prophylactic procedure are discussed, and it is concluded that in properly selected patients synovectomy can provide a lasting, local protective effect against this progressive systemic disease.

Although it is frequently performed too late, synovectomy is rarely, if ever, performed too early. Synovectomy should be performed during the synovial phase of the disease: early surgery can prevent damage; delayed surgery can at best only salvage an already damaged knee.

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